SEQUENCE LISTING

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<120> METHOD FOR PRODUCING ALCOHOL AND CARBOXYLIC ACID HAVING OPTICAL ACTIVITY

<130> P30416

<140> 10/588,286
<141> 2006-08-04

<150> PCT/JP05/02093
<151> 2005-02-04

<150> JP 027815/2004
<151> 2004-02-04

<150> JP 147023/2004
<151> 2004-04-13

<160> 13

<170> PatentIn Ver. 3.3

<210> 1
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<212> PRT
<213> Issatchenkia scutulata

<400> 1

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Met Ser Asn Lys Thr Val Leu Val Thr Gly Ala Thr Gly Phe Ile Ala
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Leu His Ile Ile Asp Asn Leu Leu Ser Lys Gly Tyr Ser Val Ile Gly
             20                  25                  30

Thr Ala Arg Ser Gln Ser Lys Tyr Gln Pro Ile Leu Asp Ala Phe Lys
         35                  40                  45

Lys Lys Tyr Pro Asp Ala Asn Leu Thr Phe Glu Val Val Pro Asp Ile
     50                  55                  60

Ser Thr Glu Asn Ala Phe Asp Asp Val Leu Lys Lys His Pro Glu Ile
 65                  70                  75                  80

Thr Ala Val Leu His Thr Ala Ser Pro Phe Ser Phe Gly Leu Asn Lys
                 85                  90                  95

Asp Leu Lys Glu Ala Tyr Leu Lys Pro Ala Val Asp Gly Thr Leu Asn
            100                 105                 110

Ile Leu Lys Ala Ile Glu Lys Tyr Ala Pro Gln Val Thr Lys Val Val
        115                 120                 125
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Ile Thr Ser Ser Tyr Ala Ala Ile Met Thr Gly Asn Pro Ser His Val
    130                 135                 140

His Thr Ser Glu Thr Trp Asn Pro Ile Asn Trp Glu Asn Asp Val Lys
145                 150                 155                 160

Asn Glu Tyr Phe Ala Tyr Ile Ala Ser Lys Thr Tyr Ala Glu Lys Ala
                165                 170                 175

Ala Arg Asp Phe Val Lys Glu His Lys Val Asn Phe Lys Leu Ala Thr
            180                 185                 190

Val Asn Pro Pro Tyr Val Leu Gly Pro Gln Leu Phe Asp Phe Ser Val
        195                 200                 205

Gly Pro Val Leu Asn Thr Ser Asn Gln Leu Ile Thr Asp Ala Thr Lys
    210                 215                 220

Ile Asp Lys Asn Ser Thr Lys Pro Glu Leu Gly Thr Pro Ala Leu Ala
225                 230                 235                 240

Val Asp Val Arg Asp Val Ala Ala Phe His Val Leu Pro Leu Glu Asp
                245                 250                 255

Asp Lys Val Ala Ser Glu Arg Leu Phe Ile Val Ala Gly Pro Ala Val
            260                 265                 270

Val Gln Thr Phe Leu Asn Ile Ile Asn Glu Asn Ile Pro Glu Leu Lys
        275                 280                 285

Gly Lys Val Ala Leu Gly Asp Pro Ala Ser Glu Lys Glu Leu Ile Glu
    290                 295                 300

Lys His Thr Asp Lys Tyr Asp Leu Thr Asn Leu His Asn Val Ile Gly
305                 310                 315                 320

Lys Tyr Asp Phe Ile Pro Val Glu Lys Ser Val Val Asp Val Leu Glu
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Gln Tyr Tyr Lys Ile Asn Lys Ile Asp
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<212> DNA
<213> Issatchenkia scutulata

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caaccaatcc ttgatgcttt caagaaaaaa taccctgatg caaatttgac ttttgaagtt 180
gtccctgaca tctccactga aaacgcattc gatgatgttt tgaagaagca tccagaaatt 240
actgctgtcc ttcacacagc atctccattc tcttttggtt tgaacaagga tctgaaggaa 300
gcatatttga agcctgccgt tgatggtact ttgaatattc tcaaggcaat tgagaagtat 360
gcaccacagg ttactaaagt tgttatcaca tcttcttatg ctgcaattat gacaggtaat 420
ccaagtcatg tccacaccag tgaaacctgg aacccaatta attgggaaaa cgatgtgaag 480

aatgaatact ttgcatatat tgcctccaag acgtatgctg aaaaagctgc gagagatttt 540
gtcaaggagc ataaggtcaa tttcaagtta gcaactgtta acccaccata cgttctgggt 600
ccacaattat ttgacttctc agttggtcca gtcttgaaca cttccaacca attgatcacg 660
gatgcgacta aaattgataa gaactctact aagccggaat taggtacacc agctttagca 720
gtcgatgtta gagatgttgc tgcgttccat gttttaccat tggaagatga taaagttgca 780
agtgaaagat tatttattgt tgctggtcca gcagttgttc aaacattctt aaacatcatc 840
aacgagaaca ttccagaact taaaggtaag gttgccctag gagatccagc ttcagagaag 900
gagttgattg aaaagcacac agataagtat gatttgacaa atcttcacaa cgttattggt 960
aaatatgatt tcattccagt tgaaaagtcc gttgtcgacg tcttagaaca atattacaaa 1020
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<210> 3
<211> 344
<212> PRT
<213> Saccharomyces cerevisiae

<400> 3
Met Ser Asn Thr Val Leu Val Ser Gly Ala Ser Gly Phe Ile Ala Leu
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His Ile Leu Ser Gln Leu Leu Lys Gln Asp Tyr Lys Val Ile Gly Thr
20 25 30

Val Arg Ser His Glu Lys Glu Ala Lys Leu Leu Arg Gln Phe Gln His
35 40 45

Asn Pro Asn Leu Thr Leu Glu Ile Val Pro Asp Ile Ser His Pro Asn
50 55 60

Ala Phe Asp Lys Val Leu Gln Lys Arg Gly Arg Glu Ile Arg Tyr Val
65 70 75 80

Leu His Thr Ala Ser Pro Phe His Tyr Asp Thr Thr Glu Tyr Glu Lys
85 90 95

Asp Leu Leu Ile Pro Ala Leu Glu Gly Thr Lys Asn Ile Leu Asn Ser
100 105 110

Ile Lys Lys Tyr Ala Ala Asp Thr Val Glu Arg Val Val Val Thr Ser
115 120 125

Ser Cys Thr Ala Ile Ile Thr Leu Ala Lys Met Asp Asp Pro Ser Val
130 135 140

Val Phe Thr Glu Glu Ser Trp Asn Glu Ala Thr Trp Glu Ser Cys Gln
145 150 155 160

Ile Asp Gly Ile Asn Ala Tyr Phe Ala Ser Lys Lys Phe Ala Glu Lys
165 170 175

Ala Ala Trp Glu Phe Thr Lys Glu Asn Glu Asp His Ile Lys Phe Lys
180 185 190

Leu Thr Thr Val Asn Pro Ser Leu Leu Phe Gly Pro Gln Leu Phe Asp
195 200 205

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Glu Asp Val His Gly His Leu Asn Thr Ser Cys Glu Met Ile Asn Gly
    210                 215                 220

Leu Ile His Thr Pro Val Asn Ala Ser Val Pro Asp Phe His Ser Ile
225                 230                 235                 240

Phe Ile Asp Val Arg Asp Val Ala Leu Ala His Leu Tyr Ala Phe Gln
                245                 250                 255

Lys Glu Asn Thr Ala Gly Lys Arg Leu Val Val Thr Asn Gly Lys Phe
            260                 265                 270

Gly Asn Gln Asp Ile Leu Asp Ile Leu Asn Glu Asp Phe Pro Gln Leu
        275                 280                 285

Arg Gly Leu Ile Pro Leu Gly Lys Pro Gly Thr Gly Asp Gln Val Ile
    290                 295                 300

Asp Arg Gly Ser Thr Thr Asp Asn Ser Ala Thr Arg Lys Ile Leu Gly
305                 310                 315                 320

Phe Glu Phe Arg Ser Leu His Glu Ser Val His Asp Thr Ala Ala Gln
                325                 330                 335

Ile Leu Lys Lys Glu Asn Arg Leu
            340
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<210> 4
<211> 18
<212> PRT
<213> Issatchenkia scutulata

<400> 4

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  1               5                  10                  15

Asp Ile
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<210> 5
<211> 15
<212> PRT
<213> Issatchenkia scutulata

<400> 5

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  1               5                  10                  15
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<210> 6
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<220>
<223> Description of Artificial Sequence: Synthetic primer

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<222> (18)
<223> Inosine

<400> 6
acnggnttya thgcnytnga yat 23

<210> 7
<211> 26
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

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<221> modified_base
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<220>
<221> modified_base
<222> (9)
<223> Inosine

<220>
<221> modified_base
<222> (18)
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<222> (21)
<223> Inosine

<400> 7
ggrttnccng tcatdatngc ngcrta 26

<210> 8
<211> 341
<212> DNA
<213> Issatchenkia scutulata

<400> 8
cattgataat ttattgtcta agggttattc cgttattggt acagctagat cccaatctaa 60
atatcaacca atccttgatg ctttcaagaa aaaataccct gatgcaaatt tgacttttga 120
agttgtccct gacatctcca ctgaaaacgc attcgatgat gttttgaaga agcatccaga 180
aattactgct gtccttcaca cagcatctcc attctctttt ggtttgaaca aggatctgaa 240
ggaagcatat ttgaagcctg ccgttgatgg tactttgaat attctcaagg caattgagaa 300
gtatgcacca caggttacta aagttgttat cacatcttct t 341

<210> 9
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 9
agggttattc cgttattggt acagctag 28

<210> 10
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<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 10
gagaatggag atgctgtgtg aaggacagca g 31

<210> 11
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<212> DNA
<213> Issatchenkia scutulata

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Met
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Ser Asn Lys Thr Val Leu Val Thr Gly Ala Thr Gly Phe Ile Ala Leu
              5                  10                  15

cac atc att gat aat tta ttg tct aag ggt tat tcc gtt att ggt aca   153
His Ile Ile Asp Asn Leu Leu Ser Lys Gly Tyr Ser Val Ile Gly Thr
         20                  25                  30

gct aga tcc caa tct aaa tat caa cca atc ctt gat gct ttc aag aaa   201
Ala Arg Ser Gln Ser Lys Tyr Gln Pro Ile Leu Asp Ala Phe Lys Lys
     35                  40                  45

aaa tac cct gat gca aat ttg act ttt gaa gtt gtc cct gac atc tcc   249
Lys Tyr Pro Asp Ala Asn Leu Thr Phe Glu Val Val Pro Asp Ile Ser
 50                  55                  60                  65

act gaa aac gca ttc gat gat gtt ttg aag aag cat cca gaa att act   297
Thr Glu Asn Ala Phe Asp Asp Val Leu Lys Lys His Pro Glu Ile Thr
                 70                  75                  80

gct gtc ctt cac aca gca tct cca ttc tct ttt ggt ttg aac aag gat   345
Ala Val Leu His Thr Ala Ser Pro Phe Ser Phe Gly Leu Asn Lys Asp
             85                  90                  95

ctg aag gaa gca tat ttg aag cct gcc gtt gat ggt act ttg aat att   393
Leu Lys Glu Ala Tyr Leu Lys Pro Ala Val Asp Gly Thr Leu Asn Ile
        100                 105                 110

ctc aag gca att gag aag tat gca cca cag gtt act aaa gtt gtt atc   441
Leu Lys Ala Ile Glu Lys Tyr Ala Pro Gln Val Thr Lys Val Val Ile
    115                 120                 125

aca tct tct tat gct gca att atg aca ggt aat cca agt cat gtc cac   489
Thr Ser Ser Tyr Ala Ala Ile Met Thr Gly Asn Pro Ser His Val His
130                 135                 140                 145

acc agt gaa acc tgg aac cca att aat tgg gaa aac gat gtg aag aat   537
Thr Ser Glu Thr Trp Asn Pro Ile Asn Trp Glu Asn Asp Val Lys Asn
                150                 155                 160

gaa tac ttt gca tat att gcc tcc aag acg tat gct gaa aaa gct gcg   585
Glu Tyr Phe Ala Tyr Ile Ala Ser Lys Thr Tyr Ala Glu Lys Ala Ala
            165                 170                 175

aga gat ttt gtc aag gag cat aag gtc aat ttc aag tta gca act gtt   633
Arg Asp Phe Val Lys Glu His Lys Val Asn Phe Lys Leu Ala Thr Val
        180                 185                 190

aac cca cca tac gtt ctg ggt cca caa tta ttt gac ttc tca gtt ggt   681
Asn Pro Pro Tyr Val Leu Gly Pro Gln Leu Phe Asp Phe Ser Val Gly
    195                 200                 205

cca gtc ttg aac act tcc aac caa ttg atc acg gat gcg act aaa att   729
Pro Val Leu Asn Thr Ser Asn Gln Leu Ile Thr Asp Ala Thr Lys Ile
210                 215                 220                 225
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gat aag aac tct act aag ccg gaa tta ggt aca cca gct tta gca gtc   777
Asp Lys Asn Ser Thr Lys Pro Glu Leu Gly Thr Pro Ala Leu Ala Val
                230                 235                 240

gat gtt aga gat gtt gct gcg ttc cat gtt tta cca ttg gaa gat gat   825
Asp Val Arg Asp Val Ala Ala Phe His Val Leu Pro Leu Glu Asp Asp
            245                 250                 255

aaa gtt gca agt gaa aga tta ttt att gtt gct ggt cca gca gtt gtt   873
Lys Val Ala Ser Glu Arg Leu Phe Ile Val Ala Gly Pro Ala Val Val
        260                 265                 270

caa aca ttc tta aac atc atc aac gag aac att cca gaa ctt aaa ggt   921
Gln Thr Phe Leu Asn Ile Ile Asn Glu Asn Ile Pro Glu Leu Lys Gly
    275                 280                 285

aag gtt gcc cta gga gat cca gct tca gag aag gag ttg att gaa aag   969
Lys Val Ala Leu Gly Asp Pro Ala Ser Glu Lys Glu Leu Ile Glu Lys
290                 295                 300                 305

cac aca gat aag tat gat ttg aca aat ctt cac aac gtt att ggt aaa   1017
His Thr Asp Lys Tyr Asp Leu Thr Asn Leu His Asn Val Ile Gly Lys
                310                 315                 320

tat gat ttc att cca gtt gaa aag tcc gtt gtc gac gtc tta gaa caa   1065
Tyr Asp Phe Ile Pro Val Glu Lys Ser Val Val Asp Val Leu Glu Gln
            325                 330                 335

tat tac aaa atc aat aaa att gat tagtttatat agaaaatttt atagctaaag  1119
Tyr Tyr Lys Ile Asn Lys Ile Asp
        340                 345

gccgaatcaa cttctttctt cctcttcaaa aaaaaaaaaa aaaaaaaaaa aaaaaaaaaa 1179

aaaaaaaaaa aaaaaaaaaa aaaaaaaaaa aaa                              1212
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<210> 12
<211> 35
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 12
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<210> 13
<211> 38
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 13
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